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NetSurv: New Methods and Open Software To Detect Spatio-Temporal Pattern for Automated Disease Surveillance

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Public Health officials charged with monitoring disease data for potential bioterrorism events and emerging natural outbreaks are faced with copious unintegrated data, insufficient tools, and time and budget constraints. This Small Business Innovation Research project focuses on integrating multiple data sources, providing a statistically rigorous analysis framework with an easy-to-use interface, and automating of routine surveillance and data updating tasks.

NetSurv is developing and evaluating new methods for disease surveillance. Existing surveillance systems and methods focus on temporal surveillance within a defined region of interest. Yet, temporal surveillance monitors only half of the picture. Surveillance must occur in space and time, as outbreaks and bioterrorism events are expected to be localized in both space and time. Using spatial information improves detection sensitivity and specificity, increasing alarm accuracy and fostering successful interventions. To expand the surveillance toolkit, we are developing new surveillance statistics by extending established disease cluster statistics. Research by our group and others has demonstrated that disease cluster statistics can be extended and applied for prospective surveillance using a cumulative sum (CuSum) approach. NetSurv employs this approach to provide a suite of surveillance statistics for locating and monitoring disease patterns in space and time.

NetSurv interfaces with National Electronic Disease Surveillance System (NEDSS) standards-compliant databases, facilitating data preprocessing and mapping for data visualization and analysis. It can interact with online and networked databases allowing for data updating and real-time analysis. One of the most important features of the NetSurv system is interactive data exploration through linked and brushable graphical views of the data, including maps, histograms, scatterplots, boxplots, and Moran scatterplots.

To allow for customization and to keep the methods current with new practices, NetSurv will have an open Python-scripting interface. This open Python interface will allow users to create scripts for new statistics and to share useful scripts with each other. With its interface for setting up routine analyses, the NetSurv software will enhance the ability of public health officials to perform routine spatio- temporal monitoring, while freeing time to spend on interventions and other duties.

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